

CIRCULAR No. 127

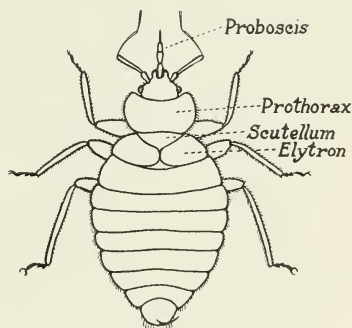
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HOUSE FUMIGATION

BY

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California is remarkably free from the otherwise ubiquitous bedbug and when it does make its appearance in a house it therefore causes great alarm. It is most frequent perhaps in bunk houses and is one of the problems of everyone employing migratory laborers. Very rarely in this country the insect is found in poultry houses.



Micrograph of common bedbug, crushed in mounting to show the mouth parts and the segments of abdomen, and sketch with these joints in normal position and the names of structures used to distinguish species of bedbug.*

* The only household species in California is the common bedbug of Europe, *Cimex lectularius* Linnaeus, probably introduced into this country with the earliest settlers. Another bedbug, *Cimex hemipterus* Fabricius, is a tropical American species without the conspicuous broad flattened edges on the pronotum. Two South American species were described fifty and sixty years ago—*Cimex foveus* Stal, similar to *C. hemipterus* and *Cimex valdivianus* Philippi close to *C. lectularius*. Since the beginning of this century three other American species have been discovered: *Haematosiphon inodorus* Duges, infesting poultry in Texas, New Mexico and southward, having a proboscis long enough to reach back to the base of the hind legs; *Cimex pilosellus* Howarth on bats here in California and elsewhere in North America with the inner edges of the elytra longer than the scutellum, and *Oeciacus vicarius* Howarth in nests of swallows from California and elsewhere, which has the body clothed with long silky hair.

The most satisfactory treatment for bedbugs is fumigation with cyanide. This method has been practiced many years in California, particularly in the southern part of the State, where there are many people familiar with the treatment of orchard trees with the gas. There is no reason why the method should not be used everywhere, whenever the bugs appear since the method is simple and easy to apply.

MATERIALS FOR FUMIGATION

Cyanide, the source of the hydrocyanic-acid gas, should be purchased in the egg form, the same as is now used in orchard fumigation. This is a pure sodium cyanide and each egg weighs approximately one ounce. It is possible to obtain good results with other forms of this cyanide but the egg form is most convenient. The least desirable form is powdered cyanide, because of the violent production of the gas causing spattering of the acid about the room.

Acid is necessary to set free the gas from the cyanide. Sulphuric acid is the cheapest acid and the one universally used—it is the practice to use more than is really necessary because it is so cheap. The ordinary strong acid is the proper material to buy. By weight use about twice as much acid as of the cyanide. It will be easier to measure out the acid by volume in which case one and one-quarter parts are about equivalent to two parts by weight.

Water is necessary for the proper generation of the gas, so that the residue sodium or potassium sulphate will remain in solution and not crystallize. The amount to use varies with the character of the cyanide. If the eggs are used, twice as much water as cyanide is necessary, and if lower grade material is employed, use three times as much water.

The recommendation made above is as follows.

	By weight	By volume
Cyanide (eggs)	1 part	
Sulphuric acid	2 parts	1¼ parts
Water	2 parts	2 parts

THE AMOUNT TO USE

Measure the room to be fumigated, calculate the cubic contents and divide the number of cubic feet by the grade of cyanide used. Thus if the room were $12 \times 15 \times 10$ the cubic contents would be 1800, and if one could only obtain 30 per cent potassium cyanide, 60 ounces would be necessary. If 98 per cent potassium cyanide were available, 18 ounces would be enough and with the eggs, which are equivalent to

128 per cent and are generally so labeled, 14 ounces would be about right. In other words, when the cyanide eggs are used as recommended use one-quarter less ounces than the number of hundreds of cubic feet in the room.

This is on the assumption that the room is tight or made so. When the construction is such that the room cannot be made tight good results may still often be secured by making the dose much stronger. No rule can be given for dosage under these conditions and the fumigator will have to use his best judgment and then take chances.

HOW TO MAKE THE ROOM TIGHT

In most cases it will pay to go to some trouble to close the cracks about windows, chimney holes, etc. This can be done by pasting paper over them. Simply stuffing paper into them is better than nothing. Professor Herrick, of Cornell University, has used paper simply wetted with water instead of paste and found it would stay in place long enough for the treatment. A great deal of the fumigation in this state has been done without trying to make the room tighter than it was built, arguing that it was cheaper to use more chemicals than to spend the time making the room tight. This will have to remain a question for the judgment of the fumigator. As remarked above, rules as to dose can only be given on the basis of a tight room.

APPARATUS FOR FUMIGATING

Where orchard fumigation is practiced and regular generators are available they are perhaps the most satisfactory. However, any tight wood or earthenware vessel of proper size will do. We have used the ordinary wooden water bucket and the common bedroom bowl and pitcher, also crocks and jars. It is better to have several generators when the room is large, putting not over a pound of cyanide in each. Spattering of the acid out of the generator is less liable to occur when the amount generated is small. We have followed the practice of spreading out several layers of newspaper upon which the generator is set to make sure not to spatter the floor. A paper sack to hold the cyanide for each generator is recommended to give ample time to get out of the room before the production of the gas begins, since the acid requires some time to soak through the paper and attack the cyanide.

TIME OF TREATMENT

The practice in orchard fumigation is to leave the tents on the trees fifty minutes or an hour, and at least this length of time should be allowed in house fumigation. Our practice has been three or four hours. For instance, if a house is vacated from ten to three o'clock the fumigation could take four hours, leaving an hour for ventilation, which is ample. In empty houses the commoner practice is to fumigate in the afternoon and leave them closed until the following morning.

DISPOSAL OF REFUSE

The residue from fumigation generators is sodium or potassium sulphate dissolved in a liquid which contains an excess of sulphuric acid and more or less hydrocyanic acid. This may be disposed of by digging a small hole in the ground into which the generators are emptied and the hole then filled up with soil. The material will temporarily injure the soil, but not permanently.

The vessels need only be washed out with water. Sometimes in a wooden or porous earthenware vessel an effervescence may appear some days later. This is the sulphate and is perfectly harmless.

PRECAUTIONS

The most important precaution is to avoid breathing the strong gas as it comes from the generator. Strong cyanide gas is instantly fatal and breathing it would be equivalent to looking down the muzzle of a gun to see the bullet start. If this one fact is kept clearly in mind fumigation is not more risky than handling firearms.

After fumigation is over it is quite safe to enter a room and open the windows, but it is wise not to breathe the air any more than necessary in doing so.

When fumigation is being done it is well to vacate the whole house so as not to take any chances.

Cyanide gas does not injure any fabric nor metal, but would kill plants at the strength used for house fumigation, and all moist food should be removed because the gas is absorbed by water.